



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

John West and Deng-ke-Yang

Group Art Unit: 2515

Serial No. 08/057,662

Examiner: Miller

Filed: May 4, 1993

For: MULTISTABLE CHIRAL NEMATIC DISPLAYS

Docket: 12-199C2

#10
1/20/95
VV

DECLARATION UNDER 37 C.F.R. § 1.132

I, Dr. John L. West, declare:

1. I am a co-inventor of the subject patent application Serial No. 08/057,662 filed May 4, 1993.

2. I have fabricated liquid crystal cells in accordance with U.S. Patent No. 4,097,127 to Werner Haas and Gary Dir. The cells were prepared as described below using the same materials and procedures set forth in Example 1 of the patent.

3. The comparative cells according to Example 1 of U.S. Patent No. 4,097,127 were prepared using a mixture of 95% by weight K15 liquid crystal available from BDH and 5% by weight cholesterol chloride. The liquid crystal mixture was filled between two glass slides placed at a thickness of 10 microns using 10 micron spacers. Each glass slide was coated with a layer of indium tin oxide to form transparent electrodes over which silicon monoxide was deposited at an angle of 60° from the normal to the glass slide. Since the Example did not specify whether the alignment of the silicon monoxide coatings on the top and bottom glass slides should be parallel or perpendicular, both were prepared. The electro-optic behavior of the resulting liquid crystal cells was observed as described below.

4. The cells can be switched into the planar (i.e., Grandjean) and the focal conic states. The focal conic state scatters light. The planar state is essentially transparent. No visible color reflection was observed from these cells, indicating that the pitch length of the materials does not reflect light in the visible spectrum.

5. The cells were observed to exhibit the switching characteristics described in the Haas patent. Applying a voltage to the material sufficient to switch the cell into the nematic (i.e., homeotropic) state renders the cell transparent when starting from either the focal conic or planar texture. When the field is removed abruptly the material transforms from the nematic state to the transparent planar state. When the field is slowly removed the material transforms from the nematic state to the scattering focal conic state. When the field is removed slowly, but not so long as will transform it completely into the focal conic state, different levels of scattering (brightness) are observed. This is due to the mixture of focal conic and planar textures described in the Haas patent.

6. The pitch length of the 95% K15 and 5% cholesterol chloride mixture according to Example 1 of U.S. Patent No. 4,097,127 was directly measured and confirmed to be reflecting outside the visible spectrum. Attached as Exhibit 1 is a photocopy of a polaroid photograph of the liquid crystal material of Example 1 of the Haas patent taken under a microscope at a magnification of 400 X. The photograph depicts the fingerprint texture of the liquid crystal between glass slides spaced apart with 20 micron spacers upon application of a 3 volt electric field. The 20 micron thick spacer is indicated by the red arrow A on the photograph. The pitch length of a liquid crystal mixture is equal to the thickness of the repeating lines of the fingerprint texture, i.e., the distance between any line in the repeating pattern and the next line of like brightness, as indicated for example at the red B on the photograph. Using the 20 micron spacer as a reference, the pitch length of the liquid crystal mixture was directly measured to be 14 microns. The reflected wavelength λ_{\max} of a liquid crystal material is given by $\lambda_{\max} = pn$, where p is the pitch and n is the index of refraction of the material. Visible light is not reflected by pitch lengths greater than about 0.5 microns. Since n is always a quantity greater than 1 (the speed of light in a vacuum) the 14 micron pitch length of a 95% K15 and 5% cholesterol chloride mixture will not reflect in the visible spectrum.

7. I hereby further declare that all statements and representations made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further

that these statements and representations were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued therefrom.

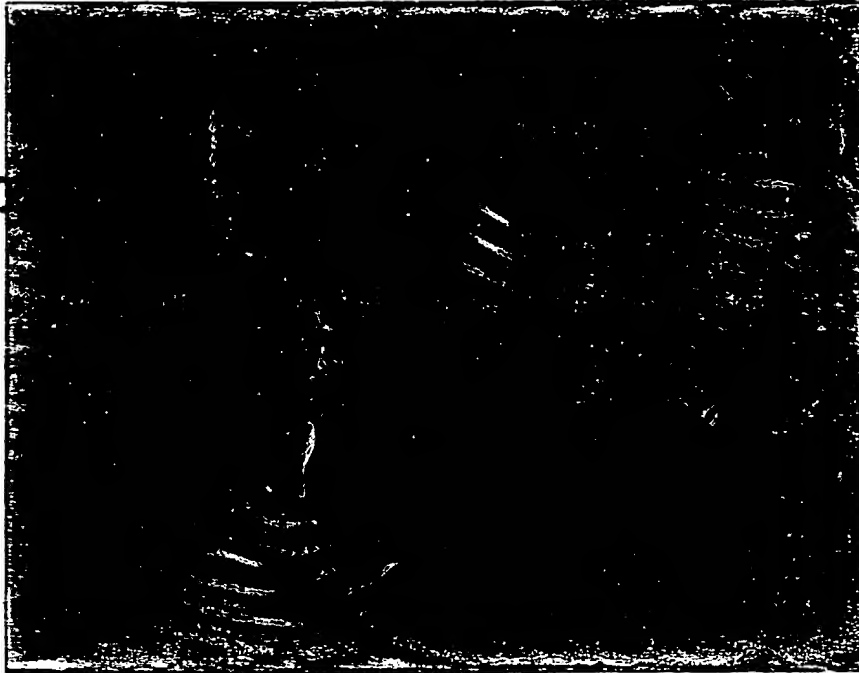
Dated: December 20, 1994


John L. West

95% K16 5% cholesterol Chloride

B I

J. West 11/28/74



6mm = 20 μ m

A

Exhibit 1